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ABSTRACT

Math avoidance has been hypothesized as related to career choice restrictions. Few attempts have been made, however, to assess the relative importance of the various components of math avoidance to career choice. Furthermore, it has been implied that persons fearful of math not only avoid specific careers but also reject careers that are otherwise seen as desirable. The purpose of this study was to examine the relative influence of several hypothesized correlates of math avoidance on academic major and career choice; and on fantasy career pursuit and rejection for men and women. One hundred twenty-nine undergraduate students responded to a personal data sheet and to two questionnaires: (1) The Mathematics Attitudes Scales (Fennema and Sherman, 1976); and (2) the Career Aspiration Scales, developed for this study. Five MAS scales discriminated groups by sex and major. Pursuers and rejectors differed by sex and major but not by attitudes toward math. Males and females differed on reasons for rejection of fantasy careers and on career discrepancies. (A bibliography is appended.) (Author/CT)

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MATH AVOIDANCE AND PURSUIT OF FANTASY CAREERS

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Abstract

Math avoidance has been hypothesized as related to career choice restrictions. Few attempts have been made, however, to assess the relative importance of the various components of math avoidance to career choice. Furthermore, it has been implied that persons fearful of math not only avoid specific careers but also reject careers that are otherwise seen as desirable.

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INTRODUCTION

Recent studies indicate that females experience more barriers than do males in perceiving a broad range of career options. DiSabatino (1976) cites internal barriers for women as greater fear of failure, lower self-esteem, heightened role-conflict, and more perceived negative consequences to achievement. Epstein (1970) lists external barriers of the protege system, stereotypes, and "the ol' boy club."

Lucy Sells (1973) suggests "high school mathematics as the critical filter in the job market." She notes that at Berkeley University, 57% of the males enter with sufficient course background to pursue college math while only 8% of the females meet this requirement. The introductory math course is prerequisite to further education in all areas except humanities, social sciences, education, and social welfare (Sells, 1973). Thereby, at the time of college entrance, majors requiring math courses are unattainable for 92% of entering freshman women at Berkeley unless remedial courses are taken first.

Investigators have pointed out the relationship between sex-role stereotyping and the pursuit of careers (Smith, 1976; Hawley, 1971, 72; Astin, 1974) indicating that most young women still see careers and family as incompatible. Astin points out that identification with the father or a working mother is a critical factor determining a woman's eventual career pursuit. Many women see careers in math and science as the most difficult to combine with family (Rossi, 1972; Prediger, McClure, and Doeth, 1976).

The avoidance of mathematics limits career options because many occupations require some math background. Although males as well as females may avoid math, evidence indicates women are much more likely to avoid advance math courses, and majors requiring mathematics. Why women avoid mathematics is a much more complex question. Fox (1976) pinpoints sex role socialization as the culprit through "perceptions of career relevance of mathematics: the influence of significant others; the perception of mathematics as a male domain; attitudes, self-confidence, and values; and educational policies and practices." (Fox, 1976, p. 3). Within attitudes Fox includes math anxiety, a factor identified by many as critical (Gough, 1954; Tobias, 1976; Dreger and Aiken, 1957; Fennema, 1974; Conady, Kogelman, & Tobias, 1976; Fennema and Sherman, 1976). The implication of previous writing is that math avoiders reject career options that would require math performance. This assumption is based on antecedotal reports, correlational studies, and untested logic (such as females do not pursue higher math; females are more likely to score higher on math anxiety instruments; and females are under-represented in math/science fields. Therefore, women must restrict and reject career options due to their math avoidance).

This study identified more directly and systematically the relative influence of attitudes toward math (as measured by seven of the nine Fennema-Sherman's scales) on career pursuit and the rejection of fantasy careers by college students. The basic research questions are "Why do people reject fantasy careers?," "What differences can be identified between math/science majors and those in other majors?" and, "What sex differences emerge?"

METHODOLOGY

Purpose

The primary focus of this study was to investigate the relative influence of several constructs hypothesized to affect career choice and academic major choice of college students. Selection of the independent variables was based on previous research and are identified in Chart 1 (List 1: Attitudes Toward Math and List 2: Personal Data).

The secondary focus of this study was more exploratory in nature. It included examining career characteristic discrepancies between pursued and rejected careers and assessed the occurrence of discrepancies across sex and area of academic major for these career characteristics (see Chart 1, List 3: Career Characteristics). The final phase of this investigation attempted to delimit potential causes of alternative (or fantasy) career rejection (see Chart 1, List 4: Reasons for Rejection). Differences across sex and academic major were examined in terms of the causes selected to explain career rejections.

Instruments

The Personal Data Sheet asked the student to report age, race, marital status, and parental occupational levels (out of seven descriptive categories). Race and age were used as screening variables only. The other variables were used as predictors of career choice and rejection.

The Fennema-Sherman Mathematics Attitudes Scales (Fennema and Sherman, 1976) contain 108 Likert type items to measure nine areas hypothesized to be related to the study of mathematics. Fennema and Sherman indicate that the

Chart 1

Independent Variable Lists

List 1: Attitudes Toward Math

(1) Math anxiety (MA)

(2) Attitude toward success in mathematics (AS)

(3) Usefulness of mathematics (U)

(4) Mathematics as a male domain (MD)

(5) Perceptions of mother's attitudes (Mo)

(6) Perceptions of father's attitudes (Fa)

(7) Perceptions of teachers' attitudes (T)

List 2: Personal Data

(1) Marital status (Status)

(2) Father's occupational status (FOCC)

(3) Mother's occupational status (MOCC)

List 3: Career characteristics

(1) Level of math required

(2) Level of chemistry required

(3) Gender dominance

(4) Prestige

(5) Responsibility

(6) Authority

List 4: Reasons for Rejection

(1) Intelligence and skills

(2) Women in career

(3) Men in career

(4) Money

(5) Economic (class) background

(6) Parental disapproval

(7) Significant other disapproval

(8) More education wanted

(9) Less education wanted

(10) Subject valence

(11) Subject phobia

(12) Fit with others

(13) Time

(14) Danger

(15) Too late to change

(16) Job market

(17) Family roles

scales (MAS) need not be utilized in total so the seven most relevant scales, based on previous research, were selected--math anxiety, attitude toward success in mathematics, usefulness of math, math as a male domain, perceptions of mother's attitudes, perceptions of father's attitudes, and perceptions of teachers' attitudes. Some items were reworded slightly for relevance to the college population. The items, from these scales, in random order comprise the research instrument.

The Career Aspiration Scales or CAS (Benton, 1978) is comprised of two separate questionnaires. The first, Form A: Pursued, requests that students respond to nine items related to the career they are presently pursuing. The first item identified the career by title, and the remaining eight items ask for information about characteristics of that career. Educational level, major, and academic requirements are selected from a series of categories for ease in coding. The remaining four ask the student to select, from five graduated categories, the male-female ratio and amount of prestige, responsibility, and authority that people have in their identified pursued career.

Next, the students read a short step-by-step guided fantasy to elicit their identification of an alternative career they may have considered or thought about in their fantasies. The second questionnaire, labeled Form B: Alternatives, requests that students respond to items about this fantasy career. These items are the same as those in Form A: Pursued, except that some are worded more tentatively to allow for the uncertain element of this career choice. For example, item three (3) in Form A, "I am majoring in. . ." becomes "If this career requires college, I'd be

majoring in. . ." in Form B.

The last section of Form B (item 12) presents seventeen reasons one might reject a career choice (Chart 1, List 4: Reasons for Rejection). Respondents are asked to indicate "true" or "false" for each option as it relates to their own perceived reasons for rejecting the fantasy career. The final item allows for inclusion of other reasons not listed in the seventeen given.

Subjects

Subjects were 149 undergraduate students who volunteered for participation from 14 different classes at Southern Illinois University at Carbondale. Students were enrolled in courses offered through the following departments:

1) Communications (69 students)
2) Chemistry (4 students)
3) Zoology (16 students)
4) Med Prep (16 students)
5) Social Welfare (21 students)
6) Psychology (23 students)

Of these, twenty were eliminated: one because questionnaires were incomplete; three because they were over the 25 years of age limit; and sixteen because they were members of minority races. For analysis, subjects were 129 Caucasian undergraduate students ranging from ages 17 to 25. The sample included 51 males and 78 females; 53 math/science majors and 76 majoring in a non-math/science field.

Procedure

Contacts with 269 potential participants were made in three slightly different manners. One class of twenty was requested by their own instructor to participate in the study: two classes (one of 25 and one of 15) were requested to participate as part of a class project; and the remaining ten classes were approached by the experimenter with the following request:

> I am a graduate student in Psychology collecting data for my dissertation on career choice. I am trying to get a cross-section of students, so I am asking for volunteers from a variety of classes on campus. There are two questionnaires, each requires about 20 to 25 minutes to complete. Who would be willing to donate approximately 45 minutes to me -- take a packet home -- and return it to class next meeting? I really appreciate your help.

The rate of volunteering (students taking packets) varied from 44% to 92% with participation above 70% except for the one chemistry class. Return rate varied from 36% to 100% with all above 60% except for the same chemistry class. The method of recruitment seemed to make little difference except that 100% of those volunteering returned packets when the instructor made the request. After completion of the questionnaires, students were debriefed and invited to request results of the study when completed.

Responses on the CAS were used to classify respondents into one of eight groups based on sex, major, and career pursuit. Students were classified as math/science majors if they reported their major required calculus or more than introductory college chemistry. Otherwise, they were different and if the educational levels differed by more than one category and/or the related major was different for the two careers.

Applying these criteria divided the sample into 59 pursuers and 70 rejectors: 53 math/science majors and 76 non-math/science majors. (S e Table 1)

Sixteen scores were utilized for each student including self-assessed parental occupational levels, marital status (dichotomized as never married--once married), career characteristics for the pursued careers; and seven MAS scale scores. In addition, those students indicating a rejected fantasy career provided data on an additional 25 variables: six career characteristics, seventeen reasons for rejection, and a decision-making style score. For these students ("rejectors"), career characteristics discrepancy scores were figured by subtracting the score for each of the six career descriptors of the fantasy career from its parallel item describing the pursued career. Students agreeing to two or three of the Planning Scale items of the ACDM were considered "planners."

Table 1

MALES AND FEMALES BY MAJOR AREA AND CAREER PURSUIT

Career Pursuit for Males

	Fantasy Rejected	Fantasy Pursued	TOTALS
Major			
Math/Science	10	20	30
Non-Math/Science	11	10	21
TOTALS	21	30	51

Career Pursuit for Females

	Fantasy Rejected	Fantasy Pursued	TOTALS
Major			
Math/Science	12	11	23
Non-Math/Science	37	18	55
TOTALS	49	29	78

ANALYSES AND RESULTS

A. Variables Contributing to Discrimination of Groups

The primary focus of this study dealt with the relative influence of multiple variables on career choice. For purposes of this study, students were classified into eight mutually exclusive groups on three dichotomous dimensions:

A. Sex: Male vs. Female

B. Major: Math/science vs. Non-math/science

C. Career Pursuit: Those pursuing their fantasy career vs. those rejecting their fantasy career.

On the basis of previous research and case reports, it was expected that groups differing in gender, academic major, and fantasy career pursuit would differ on scores attained from the Mathematics Attitudes Scales (Fennema and Sherman, 1976); would differ on marital status and report differing parental occupational levels. Restated to coincide with the chosen statistical analysis, it was suspected that ten independent variables (Chart 1, Lists 1 and 2) could be utilized to generate discriminant functions that would differentiate among the experimental groups, defined by the three dichotomous variables.

For the first hypothesis, eight groups defined simultaneously by gender, major, and career pursuit were considered in relation to the independent variables. The hypothesis tested was:

H_{o1}: The ten independent variables do not contribute to the differentiation of the eight research groups beyond that expected by chance. (alpha = .05)

The multiple discriminant function analysis using a stepwise inclusion procedure (based on the criterion of minimizing Wilk's lamda) yielded one discriminant function which adequately discriminated the observed eight groups. Since three variables made significant contributions to this function, H_{o1}, was rejected (see Table 2). The three significantly contributing variables were all MAS Scales and were entered in the following order: 1) Fa; 2) MD; 3) U.

To further examine group differences (or main effects). two groups were defined by gender alone, and the analysis repeated testing H_{o2}:

H_{o2}: The ten independent variables do not contribute significantly to the differentiation of male and female groups beyond that expected by chance.

This hypothesis was also rejected as four variables significantly contributed to the discriminant function (see Table 2). To discriminate males from females, the following variables (in order of importance) contributed significantly to accountable variance: 1) MD; 2) U; 3) AS; and 4) MA. In other words, males and females significantly differ on these four MAS Scale scores.

The sample was also partitioned according to academic major, i.e., math/science or non-math/science. Three variables were found to discriminate by major alone: 1) Fa; 2) MD; 3) U. These variables are identical to those discriminating eight groups (see Table 2). These results justified the rejection of H_{o3} which stated:

H_{o3}: The ten independent variables do not contribute significantly to the differentiation of math/science and non-math/science groups beyond that expected by chance.

Table 2

F VALUES AND WILK'S LAMDA FOR
SIGNIFICANT DISCRIMINANT VARIABLES

Analysis	Variable	F	df	Wilk's Lamda
8-Group	Fa	4.49*	1,121	.80
	MD	3.68*	2,120	.65
	U	3.03*	3,119	.55
By Sex	MD	17.67**	1,121	.88
	U	17.70**	2,120	.77
	AS	10.85**	3,119	.79
	MA	6.03**	4,118	.67
By Major	Fa	18.00**	1,121	.88
	MD	6.67**	2,120	.83
	U	8.67**	3,119	.78

* $p < .05$
** $p < .01$

Fantasy career pursuers did not differ from fantasy career rejectors on any of the ten independent variables, therefore, H_{o4} was accepted as follows:

H_{o4}: The ten independent variables do not contribute significantly to the differentiation of fantasy pursuers from fantasy rejectors beyond that expected by chance.

There is evidence, however, that males and math/science majors are less likely to reject fantasy careers than are female non-math/science majors ($\chi^2 = 5.87$; $\chi^2 = 5.89$; $p < .05$). There is no evidence from this study to suggest that attitudes toward math as measured by the MAS marital status, parental occupational levels, sex, or major relate to the rejection or pursuit of a fantasy career.

There is supporting evidence, however, that math/science majors differ from non-math/science majors on the MAS measures of Perceptions of Father's Attitudes, Mathematics as Male Domain, and Usefulness of Math. Differences are all in the predicted directions: Math/science majors report father's as more supportive and with higher expectations for offspring's success in math; math/science majors are more likely to identify math as useful; and are less likely to categorize math as a male domain. In addition, there is evidence supporting male/female differences for four MAS Scales. They do not all, however, reflect expected directions of difference. Math As a Male Domain contributed the most to the discriminant function; males being more likely to report this stereotype. The second discriminant variable was Usefulness of Mathematics with males judging math as more relevant. Males also reported less anxiety as reflected in the Math Anxiety Scale. The Attitudes Toward Success was the third discriminator, however, the means

indicate that females desired success and recognition in the area of math more than did males.

B. Discrepancies Between Career Characteristics

It was expected that the direction and magnitude of discrepancies between career characteristics of the pursued and rejected careers would be different for men vs. women and for math/science majors vs. non-math/science majors. Hypothesis H_{o5} and H_{o6} were tested to assess these differences.

H_{o5}: There is no significant difference between the mean discrepancy scores for men and women for each of the six CAS career characteristics scores.

H_{o6}: There is no significant difference between the mean discrepancy scores for math/science majors and non-math/science majors for each of four CAS career characteristics scores.

H_{o5} is retained for the items "science required," "authority," and "prestige" as there were no significant differences between discrepancies measured for men and women (see Table 3). On the "science required" items, the mean discrepancy score for men was .05 (almost no difference between pursued and fantasy careers) and the mean for women was -.73 (indicating fantasy careers required slightly more science). For the "authority" item men reported higher on pursued, while women were slightly higher on fantasy careers, (.61 for men, -.02 for women). For the "prestige" item both women and men reported their fantasy careers had slightly more prestige than that pursued (-.28 for men, -.50 for women).

Null hypothesis H_{o5} was rejected for "math required" ($t= 2.01$; $p \leq .05$) with women reporting their fantasy career required more math and men reporting their pursued career required more math. There was also a significant difference in discrepancy scores for "gender dominance" with women assessing their fantasy careers to be slightly more male-dominated than their pursued careers while men indicated their pursued careers were more male-dominant ($t= 2.93$; $p \leq .01$).

Both men and women indicated that their pursued careers included more responsibility than did their fantasy careers but the discrepancy was significantly larger for men ($t= 3.23$; $p < .01$) as indicated in Table 3.

Null hypothesis H_{o6} was tested with four two-tailed t-tests. "Math required" and "science required" were not included since they had been used to classify students into the major categories. For the items "responsibility" and "authority", H_{o6} was retained as there was not significant difference between math/science and non-math/science majors. For items, "gender dominance" and "prestige," however, the null hypothesis was rejected. Math/science majors were more likely to report their pursued careers were more male-dominated than their fantasy careers while non-science majors fantasized about careers more male-dominated ($t= 3.73$; $p < .001$). Since math/science areas are male-dominated, this finding is not surprising. Math/science majors had a mean of 0.0 for discrepancies between prestige on fantasy and pursued careers, while non-math/science majors reported their fantasy careers were higher in prestige than were the careers pursued ($t= 2.08$; $p < .044$). (see Table 4)

Three of the six career characteristics scores were different for men and women with women rejecting careers with more math requirements and greater male-dominance. Men, on the other hand rejected careers with fewer math

Table 3

MEANS, STANDARD DEVIATIONS, AND STUDENT-T VALUES

FOR CAS ITEMS COMPARING MEN AND WOMEN

Scale Item	Discrepancy Mean		Standard Deviation		Student t	Probability
	Men[a]	Women[b]	Men	Women		
Math Required	.71	-.21	2.05	1.61	2.01	.048
Science Required	.04	-.73	1.98	1.86	1.56	.123
Gender Dominance	.43	-.77	1.54	1.57	2.93	.005
Prestige	-.29	-.50	1.23	1.25	0.66	.514
Responsibility	1.14	.10	1.53	1.08	3.23	.002
Authority	.62	-.02	1.40	1.16	1.98	.051

[a] $n = 21$

[b] $n = 48$

requirements, more female dominance, and less responsibility. Math/science majors seemed to be rejecting careers more female-dominated, while non-math/science majors rejected careers more male-dominated and higher in prestige. From this date one might suspect the typical female non-math/science major to only pursue careers with fewer math requirements, greater female dominance, and less prestigious than those in her fantasies; while the typical math/science male would consider and pursue those careers with more math requirements, more responsibility, and more male-dominated than those in his fantasies. In addition, men and women alike (except for math/science majors) may dream of more prestigious careers.

C. Reasons for Rejection

Statistically, it is difficult to even imply cause and effect, however, one focus of this study was to generate and identify possible perceived reasons why one might reject a desirable career. Seventeen "reasons for Rejection" were selected and presented for endorsement on the CAS. The frequency of item endorsement is presented in Table 5. Several items had very low endorsement rates including item #2 ("because not many women are in this career"); item #3 ("because not many men are in this career"); item #6 ("because my parents would disapprove or be disappointed"); item #7 ("Because my husband, wife, or lover would disapprove or be disappointed"); and item #3 ("because I think it is too dangerous physically"). Items #1 and #16 were the most frequently endorsed with 43% and 44% endorsing these as reasons for rejection. Number 1 stated "because I lack needed intelligence or skills;" #16 stated "because jobs are scarce for this career." Other items received moderate levels of endorsement from 16% to 28%. There were no significant differences in total number of items endorsed across sex or academic major.

Table 4

MEANS, STANDARD DEVIATIONS, AND STUDENT-T VALUES FOR CAS ITEMS COMPARING MATH/SCIENCE MAJORS AND NON-MATH/SCIENCE MAJORS

Scale Item	Discrepancy Mean		Standard Deviation		Student-t	Probability
	Math[a]	Non[b]	Math	Non		
Gender Dominance	.62	-.85	1.46	1.53	3.73	.000
Prestige	.00	-.63	1.09	1.27	2.08	.044
Responsibility	.48	.40	1.50	1.23	.23	.817
Authority	.38	.08	1.16	1.30	.90	.370

[a] $n = 21$

[b] $n = 48$

Table 5

ENDORSEMENT FREQUENCIES OF REASONS FOR REJECTION

Item	Men[a] Endorsing	Women[b] Endorsing	Math/ Science[c] Endorsing	non-Math/ Science[d] Endorsing	Total Endorsing
1. Skill & I.Q.	3	26	7	22	29
2. Women	0	8	0	8	8
3. Men	0	1	0	1	1
4. Money	7	8	3	12	15
5. Class	4	10	5	9	14
6. Parents	2	6	3	5	8
7. Others	1	3	1	3	4
8. More Ed.	4	14	5	13	18
9. Less Ed.	2	17	6	13	19
10. Dislike	3	16	2	17	19
11. Fear	2	14	3	13	16
12. Fit	3	12	3	12	15
13. Other Interests	4	14	1	17	18
14. Danger	1	2	1	2	3
15. Too late	6	10	4	12	16
16. Job Market	12	18	7	23	30
17. Family Roles	2	9	2	9	11
Totals in percentages[e]	15.7%	23.5%	22%	24%	21%

[a] n = 21

[b] n = 47

[c] n = 19

[d] n = 48

[e] percentage of possible responses based on 100% = every S in category endorsing every item

For individual item endorsements, however, H_{07} may be rejected for two items. This hypothesis was stated as:

H_{08}: The proportion of men and women affirming each reason for rejection will not differ beyond the .95 chance level.

~~less than 20% of the students responded that they were married or ever had been married or "living together."~~ For items #1 ("because I lack needed intelligence or skill") and #9 (because I didn't want to stay in school that long") significantly more women than men indicated the statement was true for them ($\chi^2 = 8.83$; $p < .003$; $\chi^2 = 3.88$; $p < .048$, respectively).

Hypothesis H_{09} as stated:

H_{09}: The proportion of math/science and non-math/science majors affirming each reason for rejection will not differ beyond the .95 chance level.

may be rejected for one item. More non-math/science majors than math/science majors affirmed the statement "because I wouldn't have time to pursue other interests" ($\chi^2 = 5.24$, $p < .022$). Item #10 also produced results approaching significance; seventeen non-math/science majors endorsed the item "because I don't like some of the subjects I would have to study," while only two math/science majors marked this item true ($\chi^2 = 3.35$; $p < .067$). Of the eleven who took the opportunity to identify which subjects they disliked, eight wrote in "math and science," two wrote in "chemistry," and one wrote in "law."

Only three items differentiated the pairs of groups: two by sex and one by major. The most global item ("because I lack needed intelligence or skills"), however, was one that received significantly more female affirmations.

There is no reason to assume that actual intellectual differences are present as males and females were roughly equally represented in all courses, beginning and advanced, where subjects were recruited. A higher proportion of women, however, did respond as participants. Item #9 may support lower educational aspirations for women as a reason for rejection of certain careers while item #13 may affirm the belief that math/science careers are overly-demanding.

D. Summary

Five MAS Scales contributed to group discriminations (MD, MA, Fa, U, and AS) in the multiple discriminant analyses. None of the three personal data variables were contributors. Three discrepancy scores derived from assessments of fantasy and pursued career characteristics were related to sex and two were related to major. Finally, there were two "reasons for rejection" more often endorsed by women and one more often endorsed by non-math/science majors.

DISCUSSION

Variables Contributing to Group Discrimination

Five attitudes toward math (as measured by the MAS) contributed to the discriminant functions classifying students. The Math as a Male Domain Scale and the Usefulness Scale were identified as significant discriminant variables of sex, major, and the eight tri-dimensional groups. The Perception of Father's Attitudes Scale contributed to classification by major and into the eight groups. In the analysis by sex, the Attitudes Toward Success Scale and the Math Anxiety Scale discriminated males from females. None of the independent variables discriminated on the career pursuit dimension, however pursuers were more likely to be males than females, and more likely to be math/science majors.

Consistent with other findings, math/science majors and males perceived math as more useful (Haven, 1971; Hilton and Berglund, 1974). Contrary to earlier findings (Casserly, 1975; Farley, 1974), males were more likely to stereotype math as masculine than were females. It appears that choices were more likely made in terms of usefulness rather than notions of sex-role appropriateness. This attitude should be the most responsive to instruction through demonstrating the importance of math to everyday tasks as well as to many new and interesting careers. It may also be reflective of the findings that girls receive less career guidance than do boys (Haven, 1971; Casserly, 1975). It is not clear whether sex-role stereotyping was related to avoidance. Although women were less likely to define math as masculine than were men, women may still make choices to avoid math because they believe important men in their lives define math as masculine (Hawley, 1972; Helson, 1971).

Math/science majors reported that their fathers valued math and the students as learners of math more often than did non-math/science majors. This finding seems to merely support learning (or reinforcement) theories.

Females reported a greater desire to experience success in math than did males. This finding seems to contradict women's devaluing of usefulness, but may reflect a desire for unattained success that has already restricted goals for women and eliminated them from fields where math would be seen as useful. Counter to Horner's sample (Horner, 1972), today's female college students may be striving for rather than fearing success.

The Math Anxiety Scale further discriminated males from females, with females reporting more discomfort with math. This scale did not discriminate by major or the eight groups, indicating that although women may be more math anxious than men (Ernest, 1976; Fennema, 1974; Fox, 1976; Tobias, 1976), they are not as likely to avoid math/science fields because of fear as because of other beliefs about math; namely, that they evaluate math as less useful in their lives than do men and women who select math/science fields. Treating math anxiety and ignoring the perceived usefulness of math may increase comfort but on the basis of this study, no change in career pursuits would be expected.

Since none of the independent variables discriminated fantasy career pursuers from rejectors, this remains an elusive concept. Women were more likely to report fantasy careers than were men but it is not clear whether this is reflective of dissatisfaction with present pursuit, more active fantasy lives, or merely a willingness to respond to the extended form. At any rate, pursuit versus rejection was unrelated to math attitudes and the personal data variables tested in this study.

To expand career options limited by math avoidance, the most important intervention targets appear to be Usefulness Math as a Male Domain, and Math Anxiety (although the relationship of math anxiety to avoidance is unclear) when working with college women.

Discrepancies Between Career Characteristics

Male/female differences emerged on math requirements and gender dominance discrepancies. Although math attitudes were non-discriminating of academic major, there were sex differences on math requirements, with women indicating that their fantasy careers required more math than did their pursued careers and males indicating the reverse. This finding supports Tobias' reports that women claim to want to avoid majors requiring math even if the field is otherwise appealing (Tobias, 1976).

Reasons for Rejection

Non-math/science majors endorsed the item "because I wouldn't have time to pursue other interests" more often than did math/science majors. Since math/science fields are generally assessed as the most demanding (Rossi, 1965; Prediger, McClure, and Doeth, 1976; Havens, 1972), it was not surprising that persons electing non-math/science fields would be those valuing less-demanding careers.

Women reported low abilities and lower educational aspirations as reasons for rejection more often than did males (i.e., "because I lack needed intelligence or skills," "because I didn't want to be in school that long"). As demonstrated previously, females tend to underestimate their abilities (Maccoby and Jacklin, 1973; Brown, 1978), thus, lowering their aspirations. Parents tend to accept the lowered aspirations of female

children (Casserly, 1975) while teachers seem to be more interested in the progress of male students (Almquist, 1974). Females are thereby left with faulty academic self-perceptions if teachers fail to encourage them and parents tend to expect less. In this college sample, the effects of this early learning remain evident.

Integration of Findings

The faulty self-perception is one explanation for the higher proportion of women than men reporting rejected fantasies. Women may learn early not to expect the careers they want because they believe they don't have necessary skills or intelligence. As pointed out by Singer (1976), fantasy, although healthy and normal, is also soothing when hopes or goals are unattainable. Fantasies, for women, may serve as a panacea, while men are more likely to take action to achieve their goals.

Women's attitudes about success may be changing, altering their acceptance of lower aspirations. This sample of women did not stereotype math as masculine as much as the men did and they reported fantasies of careers as prestigious, less female-dominated, and with as much authority as did men. With changes in teacher and father encouragement, the treatment of math anxiety, and career education demonstrating the usefulness and relevance of math, one would predict (on the basis of these sample differences) women would move toward math/science fields.

Directions for Future Research

The identification of relevant variables to the pursuit and avoidance of math/science fields remains inadequate. Sex continues to be the best predictor of career choice and the one variable studied that cannot be

manipulated. Other variables that appear to contribute to the choice of math and science are perceiving math as a male domain, a relative lack of math anxiety, and a supportive father. These variables, however, are confounded by higher correlations with sex than with career choice. Further research, controlling statistically for sex as a covariate, is recommended to better identify variables where intervention is possible.

Since none of the math avoidance variables discriminated fantasy career pursuers from rejectors, no more is known about this phenomenon except women and non-math/science majors are more likely rejectors. On the basis of the exploratory phases of this research, time and goal priorities, and academic self-concept might be pursued in future research. Other possibilities as suggested by previous research may also help in understanding lowered aspirations (i.e., age of job entry, learned helplessness, career guidance, sex-role socialization, etc.). Structured interviewing may generate other variables for exploration.

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